

TWO NEW SPECIES OF FOSSIL MAYFLIES
(EPHEMEROPTERA: NEOEPHEMERIDAE AND SIPHLONURIDAE)
FROM THE RUBY RIVER BASIN (OLIGOCENE)
OF SOUTHWESTERN MONTANA¹

Standley E. Lewis

Abstract.—Two new species of mayflies, *Potamanthellus rubiensis* (Neoephemeridae) and *Isonychia alderensis* (Siphonuridae) are described from the paper shales of the Ruby River Basin (Oligocene) of southwestern Montana. These are the first to be described from this formation.

Sixteen fossil impressions of immature mayflies (Ephemeroptera: Neoephemeridae and Siphonuridae) have been discovered from the paper shale deposits of the Ruby River Basin of S.W. Montana. Fifteen of the sixteen specimens belong to the family Neoephemeridae and represent a new species of the genus *Potamanthellus* Lestage. It is significant to note that the living *Potamanthellus* nymph is yet undescribed, but the fossils appear congeneric with extant nymphs of *Potamanthellus* in the collections of the University of Utah (personal communication, Edmunds, 1974). The other specimen found belongs to the family Siphonuridae and represents a new species of the genus *Isonychia* Eaton. These two new species represent the first members of either family to be described from this locality. The fossils were found in paper shale deposits of Oligocene age between Peterson and Mormon Creeks, Sec. 23, T7S, R5W, Madison County, Montana. A brief description of the geologic history of this region can be found in a previous paper (Lewis, 1971).

Systematic Description

Order Ephemeroptera

Family Neoephemeridae

Subfamily Neoephemerinae

Potamanthellus rubiensis Lewis, new species

(Fig. 1)

Described from a dorsal view of an incomplete mayfly nymph with parts of legs and caudal filaments obscured or missing in preservation. Body light brown in color with some detail missing. Legs extended outward in preservation. Length of body 12.0 mm; width of body at widest point 2.5 mm.

Head.—Head brown in color. Eyes large and somewhat circular in shape (.6 mm across). Antennae not visible. Slight median ridge present between eyes. Length and width of head 1.0 mm and 1.7 mm respectively.



Fig. 1. *Potamanthellus rubiensis*, dorsal view of complete nymph (7.0 \times).

Thorax.—Prothorax 1.2 mm in length and 2.0 mm in width at widest point. Pronotum somewhat rectangular in shape with anterior margin slightly concave; anterolateral covers of pronotum slightly pointed. Prothoracic femur complete and stout. Proximal $\frac{1}{2}$ of prothoracic tibia present. All thoracic legs showing a mottled color pattern. Each tarsal claw long, slender and edentate. Metathoracic wing pads large measuring 3.4 mm in length. Posterior margin of the dorsal portion of the metathorax with no minute, median, backward projecting spine visible.

Abdomen.—Length and width of abdomen 6.8 mm and 2.2 mm respectively. A pair of elyroid gill on 2nd segment, covering the gills of the 4 following abdominal segments. Abdominal segments 6–8 with minute

dorsal median backward-projecting spines. (This single feature not visible on holotype, but evident on specimen RR4-1.) Lateral posterior margins of abdominal segments pointed. All caudal filaments well developed. Median caudal filament approximately 5.0 mm in length. Short spines not visible on any of the filaments (this is probably due to preservation).

Discussion.—The larval form described above is definitely a caenid-type. In the present day fauna, this caenid-type of larvae is characterized by two families: Caenidae and Neophemeridae.

Larval forms of these two families are distinguished by the degree of development of the metathoracic wing pads, the overall body length, and the presence or absence of thoracic and abdominal carinae (Edmunds et al., 1963). The specimens found at the Ruby River sites show a well-developed metathoracic wing pad, a longer body length and a median carina on abdominal segments 6–8. The specimens show no distinct pronotal carina terminating at the anterolateral angles. These morphological features are all indicative of the family Neophemeridae. Because of their size and morphology, the larvae described in this paper belong to the family Neophemeridae (body length of present-day forms: 8–17 mm) and not in the family Caenidae (body length of present-day larvae: 3–7 mm).

Type-material.—Holotype: No. B-60. Found near Alder, Montana, by H. F. Becker; 196?. Oligocene sediments of the Ruby River Basin; reverse absent. Paratypes: Nos. B-13, B-20, B-58 (reserve present), B-59, B-61, B-62, C-1 (reverse present), C-2, RR-1-34, RR-4-1, 6-40, 6-117, 6-23 and 6-290, all found near Alder, Montana, by H. F. Becker; 196?. Oligocene sediments of the Ruby River Basin. Specimens maintained temporarily with S. E. Lewis Biology Department, St. Cloud State University, St. Cloud, Minnesota 56301.

Order Ephemeroptera

Family Siphonuridae

Subfamily Isonychiinae

Isonychia alderensis Lewis, new species

(Fig. 2)

Described from a lateral view of a complete nymph with head and legs somewhat obscured. Body light brown in color with little differentiation from the rock material that surrounds it. Length of body (excluding caudal filaments) 13.40 mm; width of body at widest point 3.17 mm.

Head.—Head ovoid in lateral perspective. Eyes also ovoid in shape, measuring .90 mm in length and .48 mm in width. Antennae not distinguishable. Maxillary gill tufts present. Length and width of head: 3.6 mm and 2.2 mm respectively.

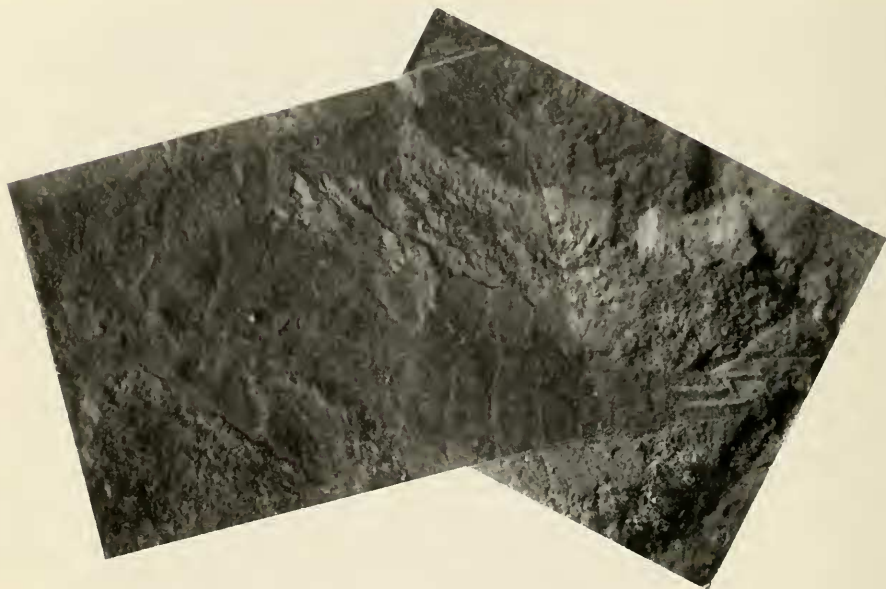


Fig. 2. *Isonychia alderensis*, lateral view of complete nymph (8.1 \times).

Thorax.—Prothorax somewhat triangular in shape from lateral view. Length of prothorax .98 mm. Other thoracic regions not distinct. Total length of thorax approximately 4.0 mm. Thoracic appendages not well preserved. Fore coxal gill tufts not visible.

Abdomen.—Length and width of abdomen 7.3 mm and 2.9 mm respectively. Plate-like gills visible on abdominal segments 1–7. When not visible on both sides, poor preservation is indicated. Ventral fibrillar tufts of abdominal gills not preserved. Three well-developed caudal filaments. Dense fringe of setae on inner side of each cercus not preserved.

Type-material.—Holotype: No. C-3. Found near Alder, Montana, by H. F. Becker; 1962. Oligocene sediments of the Ruby River Basin; reverse absent. Specimen maintained temporarily with S. E. Lewis, Biology Department, St. Cloud State University, St. Cloud, Minnesota 56301.

Discussion.—This nymph bears definite maxillary gills, with fore coxal gills strongly suspected but not preserved. Each abdominal gill is composed of a plate-like dorsal element and probable ventral fibrillar tufts—the latter strongly suspected, but not preserved. These morphological features indicate the placement of this specimen into the subfamily Isonychiinae. The dorsal plate-like portion of the abdominal gills do closely resemble species of the genus *Isonychia* Eaton (Burks, 1953, fig. 225).

Because of the morphological similarities to the genus *Isonychia*, the specimen is placed in this genus. Due to the geologic age, this fossil nymph warrants recognition as a new species.

The present-day nymphs of this genus are streamlined, vigorous swimmers which develop in fast moving creeks and small rivers. Although they are known to be predaceous, they feed primarily on algae and vegetative detritus. The nymphs inhabit a wide variety of streams and rivers in the Holarctic and Oriental regions and have been found as far south as Veracruz Province in Mexico (Edmunds et al., 1963).

Acknowledgments

I wish to thank H. F. Becker of the New York Botanical Gardens and G. F. Edmunds of the University of Utah for the loan of these fossils. This field research was funded through grants from the Geological Society of America, Society of Sigma Xi and the St. Cloud State University Institutional Research Fund.

Literature Cited

- Burks, B. D. 1953. The Mayflies, or Ephemeroptera, of Illinois. Bull. Ill. Nat. Hist. Surv. 26(Art. 1):1-216.
- Edmunds, G. F., R. K. Allen, and W. L. Peters. 1963. An annotated key to the nymphs of the families and subfamilies of Mayflies (Ephemeroptera). Univ. of Utah Biol. Series. 13(1):1-49.
- Lewis, S. E. 1971. A new Species of Fossil Diptera (Diopsidae) from the Ruby River Basin (Oligocene) of Montana. Ann. Entomol. Soc. Amer. 64:959-960.

Footnote

¹This research was funded through grants from the Geological Society of America, Society of Sigma Xi and St. Cloud State College Institutional Fund.

Department of Biological Sciences, St. Cloud State University, St. Cloud, Minnesota 56301.